# PATENT SPECIFICATION

DRAWINGS ATTACHED

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International Classification: —B23d k, B29c.

COMPLETE SPECIFICATION

## Improvements in or relating to Rotary Shears

We, S.T.E.F.A.S.—Soc. R.1., of Este, Padova, Italy, an Italian body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention concerns rotary shears for cutting sheet or plate of any size, for example of metal or of plastics material, such cutting being capable of being done along straight or curved lines.

According to the present invention there is provided a rotary shear for cutting sheet, in which two co-operating hand or power driven cutting discs are journalled in side walls of a frame, which side walls are joined at the rear of the discs by a cross-member which interconnects the top of one side wall with the bottom of the other side wall and which side walls diverge outwardly towards the back of the shears, whereby any sheet which is being cut divides into two passages whose free cross section increases so that the sheet can be manoeuvred without the separated sheet fouling the side walls.

The cutting discs can be hand or power driven.

When it is desired to make curved cuts, the sheet will be pivoted about the point at which cutting is occurring, the discs being tangential to the curve at the point at which cutting is occurring. In order to facilitate this pivoting which needs a certain amount of unencumbered space both ahead of and behind the blades, the two passages mentioned above, each present a curved wall in opposite directions and at different heights, so that the operator is free to move the sheet as required to perform the desired cut.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which: —

Fig. 1 is a side elevation view;

Fig. 2 is a front view;

Fig. 3 is a plan view;

Fig. 4 is a shears according to the invention, adapted to receive various attachments;

Fig. 5 is a detail of the ratchet lever for a hand-operated version of the machine;

Fig. 6 and Fig. 7 represent rotary discs for the cutting of strips and the folding and grooving of sheet;

Fig. 8 represents a disc fitted with heating resistances;

Fig. 9 is a general view of the shears fitted with an attachment for the straightening of sheet strips;

Fig. 10 shows how slots can be cut in sheet with a machine according to the invention; and

Fig. 11 shows how spiral cuts can be made.

With reference to Figs. 1 to 3, the shears consists of a frame, two rotary disc blades and a drive intended to have both blades rotate at the same peripheral speed and in opposite directions.

The frame comprises a base 15 from which rises a vertical or slanted side wall 16, comprising in turn two parts, a front flat part 16*a* and a rear curved part 16*b*.

A substantially horizontal cross member 17 is fastened to the rear part 16*b*. The cross member 17 has a sloping lower face, its thickness gradually increasing from a thin front edge to a thick rear edge.

Above the cross member 17 and integral with it rises a second side wall 18, comprising a flat part 18*a* and a curved part 18*b* opposite 16*b*. The two walls 16 and 18 are disposed at different heights above the base 15 and define, one on the right and the other on the left, the passages referred to above.

On the front flat part 16*a* is rotatably mounted a cutting disc 20, and on the part 18*a* above it is rotatably mounted the co-operating disc 21. The two blades are adapted to co-operate at point A to shear the sheet of metal.

[Price 4s. 6d.]

In general, the two disc blades are not tangential but have a small overlap, allowing the sheet to take curved cuts is easier when this overlap is very small, or when the plane of the discs is inclined to a certain degree with respect to the upper face of member 17. In some cases the discs need not be in contact with each other and shearing will occur with a slight gap. The discs will be mounted in bushings allowing them to be adjusted in height to suit the precise application.

The two discs 20 and 21 may be hand driven or power driven. In the former case (Fig. 3) a gear 24 is keyed to the shaft 23 which carries the blade 21. This gear 24 meshes with a gear 25, whose shaft 26 is carried by a bracket 27 fastened to the part 18*b*. A gear 28, through another gear 29, drives a shaft 30 which goes through the rear part of the shears, and by means of gear $29^1$ drives a group of shafts and gears, with a gear 31 interposed between $29^1$ and $28^1$ to the end of reversing the rotation of disc blade 20.

In Fig. 3 the components of the left-hand gear train are marked with the same numbers as the corresponding components of the right-hand drive, with the addition of the mark $^1$.

The discs are driven by means of a lever 32 fitted with an eye which fits around the shaft 23, which carries ratchet-wheel teeth into which engage similar teeth on the face of a cylinder 33 which is pushed by a spring 34 against the teeth of the shaft 23. The thrust of the spring is adjustable by means of the screw 35. As the lever 32 is moved back and forth, the discs will rotate in the cutting direction.

When the shears are power-driven, the motor is preferably mounted underneath the base 15, the driven being taken through a gear reducer to the gear 31, which drives the disc blades through the train described above.

Fig. 4 represents a modification of the shears, mainly intended for the mounting of various attachments that enable it to perform special operations.

Also in this solution are evident the two passages for the directing of the two sheet parts after cutting. One of these passages is delimited (Fig. 4) by the vertical or slanted wall 18 and by the horizontal plate 17. The other passage lies behind the wall 16, and is limited above by the same plate 17, which presents the inclined section, shown in dotted line in Fig. 4.

Fig. 11 (in which for the sake of clarity, the blade drive components have been omitted) shows the shears of Fig. 4 fitted with various attachements, which are not necessarily intended to be used at the same time.

A rod 43 is axially slidable relative to the shaft on which the disc 20 revolves, for example the shaft can have a hollow base. This rod extends right and left of the disc, supported by one or more brackets 41 fixed to the base 15, one of its ends being shaped as a gooseneck $43^1$. The upper end of gooseneck $43^1$ carries a sleeve 49 on which is mounted a bearing 45 which, in combination with another opposing bearing $45^1$ clamps at the appropriate point a sheet from which a disc is to be cut. The bearings 45 and $45^1$ which rotate as the sheet is moved, are mounted on pivots and are tightened together by a screw 46 fitted with a lock nut 47. The opposing bearing is supported by a bracket 50, which can be locked in a suitable position on rod 43 by means of the screw 51. The rod 43 when locked on the work pieces will have little tendency to turn.

When small-diameter discs are to be cut out of the sheet, a U bracket 44 (Fig. 4) is used, fitted with horizontal arms the ends of which carry bearings similar to that described above.

When the disc can be drilled or centre-punched, the bearings 45 and $45^1$ are not necessary. The screw 46 ends with a point which serves as a centre of rotation for the drilled or centre punched disc.

The column support 52 (Fig. 11) makes it possible to cut strips of sheet of constant width and at the desired angle to the direction of feed of the sheet. To this end the said support presents, rotatable around a bushing which can be locked by a grub screw, a plate 53 turned towards the tangent point of the two disc blades.

Fig. 6 shows how a ribbon of the desired width can be cut from the sheet. Instead of discs 20, 21 there are mounted on the shafts two discs 54 and $54^1$, the latter having on the periphery a sharp-edged groove which is matched by a cutting edge of disc 54.

When the edges of a sheet are to be bent to various shapes, a pair of rollers 55—$55^1$ (Fig. 7) is used in place of one of the discs 20, 21 and when, for instance, a cut is to be taken to part from the sheet, a shaped strip or the like, there is placed beside roller 55 a cutting disc 56 which parts the sheet continuously.

In certain cases depending upon the nature of the starting material, splintering of the cut edges of sheet is prevented by heating the discs by means of electric resistances powered through sliding contacts or like arrangements.

In these cases, the resistances 58 are placed inside the blades and receive power from brushes 59 which slide on slip rings 60.

It may be of interest when using shaped cutting discs to use these resistances to heat the discs.

For instance, a pair of blades of this type can be used to cut corrugated sheet, or scalloped blades to make decorative cuts in the sheet material (Fig. 8).

It often happens that strips or ribbons cut by the discs shown in Fig. 6 show a tendency to curl up into spirals. In these cases, provi-

sion is made for a device consisting of two or more discs 61 which straighten the strips (Fig. 9).

Fig. 10 is a diagrammatic representation of a shears in which one of the discs is keyed to an eccentric journal pin 62. During part of its revolution, the blade will rise above the surface of the sheet to be cut, enabling the sheet to be inserted into the opening 70. If the latter is sufficiently deep, slots or blind cuts can be effected by using a pair of discs as shown in Fig. 6.

Fig. 11 shows how a continuous ribbon can be cut from a disc, following a spiral line. To a bushing 66 on which is keyed the disc blade 20 is fastened the bevel gear 67 which meshes with a similar gear 68 mounted idly below plate 17.

The bevel gear 68 drives the similar gear 69 mounted on a bushing revolving in bearings of the bracket 41.

In this bushing, a threaded sleeve 64 fixed to the rod 43, can slide axially, so that the gear 69 which has an internal threaded section, moves the rod 43 and with it the centre of the disc 65 and the disc blades 20—21 take a spiral cut of a pitch proportional to that of the screw 64. The rod 43 may be restrained by virtue of the bearings 45, 45[1] gripping the sheet or may be restrained in other ways.

If instead of the sleeve 64 there is fastened to the rod 43 a sleeve with grooves of suitable form into which fit pins projecting inside the gear 69, it will be possible to cut sheet and discs with helical or otherwise shaped edges.

WHAT WE CLAIM IS:—

1. A rotary shear for cutting sheet, in which two co-operating hand or power driven cutting discs are journalled in side walls of a frame, which side walls are joined at the rear of the discs by a cross-member which interconnects the top of one side wall with the bottom of the other side wall and which side walls diverge outwardly towards the back of the shears, whereby any sheet which is being cut divides into two passages whose free cross section increases so that the sheet can be manoeuvred without the separated sheet fouling the side walls.

2. A rotary shear as claimed in Claim 1, in which the side walls are made up by a plane part and a curved part, the curved parts diverging, so as to allow the free movement of the sheet in its plane.

3. A rotary shear as claimed in Claim 1 or 2, in which the discs are hand-driven by means of a ratchet lever mounted on the shaft of one of the discs to which shaft is also keyed a gear which drives a similar gear keyed to the other disc blade through a gear train whose components are mounted on the faces of the side walls opposite to that facing the passages, the peripherical speeds of the two disc blades being equal, and an idler gear being inserted in the gear train for the purpose of making the disc blades rotate in opposite directions.

4. A rotary shear as claimed in Claim 1 or 2, in which the disc blades are driven by a motor.

5. A rotary shear as claimed in Claim 1, 2, 3 or 4, in which the discs are mounted in bushings arranged in such a fashion that the distance between blades can be suitably adjusted.

6. A rotary shear as claimed in any of Claims 1 to 5, fitted with a rod for mounting guide attachments mounted slidably but not rotatably in a hole of the shaft of the lower disc blade and supported also by brackets fastened to the shears base.

7. A rotary shear as claimed in Claim 6, in which the motions of the sheet to be cut are combined with an axial motion of the attachment carrying rod, which, by moving the sheet away from or towards the disc blades, enables spiral cuts to be made.

8. A rotary shear as claimed in any of Claims 1 to 7, in which shaped rollers are used to bend the sheet to the desired shapes.

9. A rotary shear as claimed in any of Claims 1 to 8, in which grooved discs with cutting edges are used to cut sheet by removing a ribbon-shaped strip.

10. A rotary shear as claimed in Claim 8, in which a rotary blade is mounted adjacent the discs.

11. A rotary shear as claimed in any preceding claim, in which the blades are heated by electric resistances.

12. A rotary shear as claimed in any preceding claim, in which the shaft of either of the blades is mounted eccentrically to produce blind cuts in the sheet.

13. A rotary shear as claimed in any preceding claim, which is provided with rollers to straighten the strips cut from the sheet after cutting.

14. A rotary shear constructed and arranged substantially as described herein with reference to and as illustrated in the accompanying drawings.

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83/500

892215 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

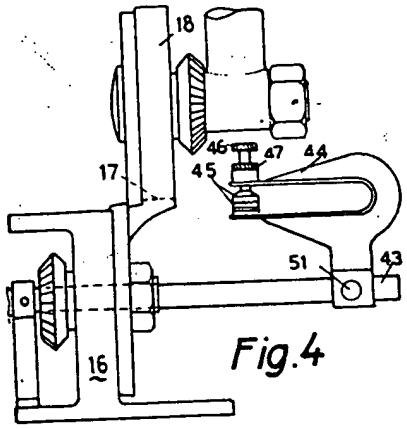


Fig.4

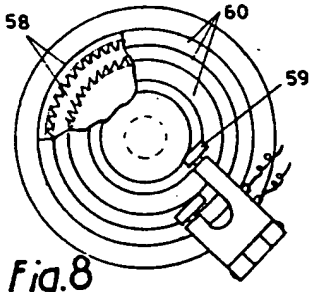


Fig.8

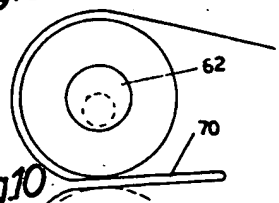


Fig.10

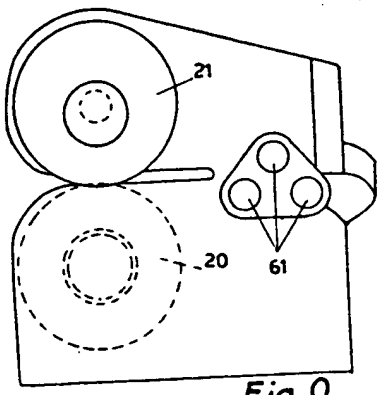


Fig.9

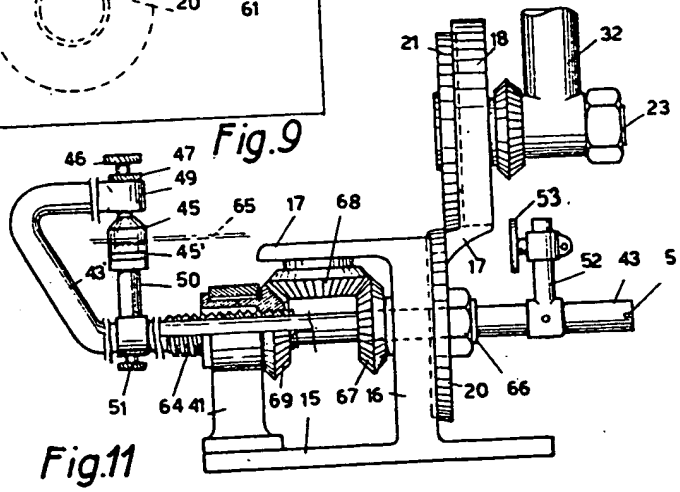


Fig.11

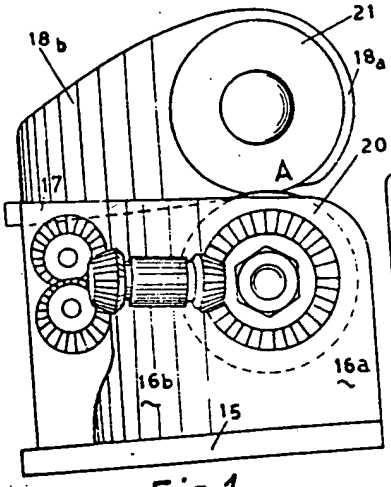


Fig.1

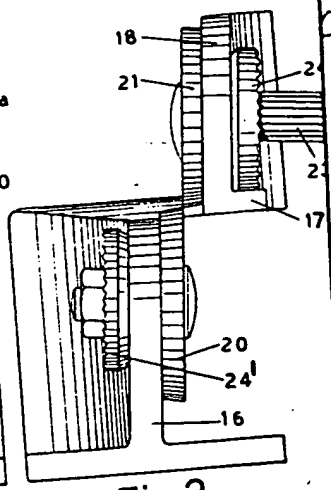


Fig.2

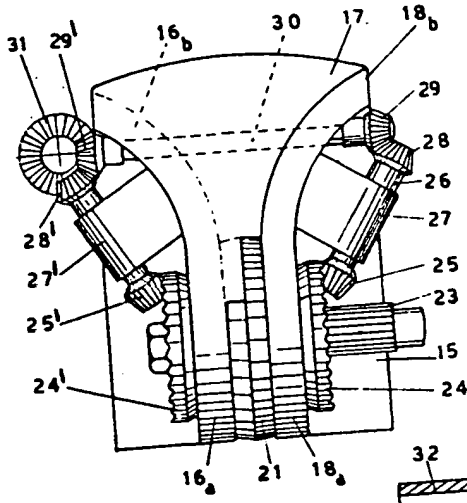


Fig.3

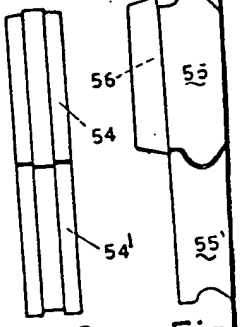


Fig.6

Fig.

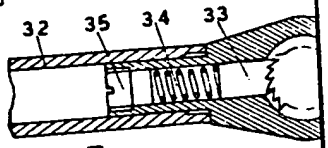


Fig.5